UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/667,475	09/23/2003	Herbert Bruder	32860-000622/US	9058

30596 7590 06/26/2009
HARNESS, DICKEY & PIERCE, P.L.C.
P.O.BOX 8910
RESTON, VA 20195

EXAMINER	
CORBETT, JOHN M	
ART UNIT	**PAPER NUMBER**
2882	
MAIL DATE	**DELIVERY MODE**
06/26/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/667,475	BRUDER ET AL.	
	Examiner	Art Unit	
	JOHN M. CORBETT	2882	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 September 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *23 September 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *29 March 2007*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☒ Other: *IDS- 11 July 2008*.

DETAILED ACTION

Information Disclosure Statement

1. The information disclosure statement filed 11 July 2008 fails to comply with 37 CFR 1.98(a)(3) because it does not include a concise explanation of the relevance, as it is presently understood by the individual designated in 37 CFR 1.56(c) most knowledgeable about the content of the information, of each patent, publication, or other information listed that is not in the English language. The DE 19711693A1 reference and German office actions dated 8 July 2003 and 11 June 2008 lacked a concise statement of relevance and therefore have not been considered.

Claim Objections

2. Claims 14-15, 22 and 24 are objected to because of the following informalities, which appear to be minor draft errors including grammatical and/or lack of antecedent basis problems.

In the following format (location of objection; suggestion for correction), the following correction(s) may obviate the objection(s):

(Claim 14, line 1, "CT" was claimed, perhaps "computed tomography (CT)" was meant).

(Claim 22, line 2, "CT" was claimed, perhaps "computed tomography (CT)" was meant).

(Claim 24, line 1, "CT" was claimed, perhaps "computed tomography (CT)" was meant).

Claim 15 is objected to by virtue of its dependency.

Note: The first instance of an abbreviation used in a claim should explicitly state the term or phrase which is being abbreviated.

Claim 24 is objected to because of the following informalities: Claim 24 is a substantial duplicate of claim 21. See MPEP § 706.03(k).

Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-4, 9, 13-16, 19, 21-22 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tam (US 5,881,123) in view of Tam et al. ("Exact (Spiral + Circles) Scan Region-of-Interest Cone Beam Reconstruction via Backprojection", 2000, IEEE Transactions on Medical Imaging, Volume 19, Number 5, Pages 376- 383).

With respect to claim 1, Tam ('123) discloses a method of creating images in computed tomography (Title), comprising:

rotating (via 208 on path 214) at least one focus (210), to scan an object (216) under examination with a beam originating from the at least one focus (Figure 2), relative to the object on at least one focal path running around the object (Figure 2), a detector array (212) including a

plurality of distributed detector elements (Col. 3, lines 65-67) is adapted to detect rays of the beam and is adapted to supply initial data representing an attenuation of the rays passing through the object under examination (Col. 4, lines 15-26);

filtering the initial data (Abstract);

backprojecting the filtered initial data, three-dimensionally (Abstract), to produce at least one slice of a layer of the object having a layer thickness, the slice representing radiation absorption values of voxels belonging to the layer of the object (Col. 4, lines 27-30).

Tam ('123) fails to explicitly disclose the rays are weighted as a function of corresponding position in the beam.

Tam et al. teaches the rays are weighted as a function of corresponding position in the beam (Equation 5).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method of Tam to include the weighting of Tam et al., since a person would have been motivated to make such a modification to improve imaging improving reconstruction speed as is known in the art.

With respect to claim 2, Tam further discloses the filtering is carried out in the direction of the tangent to the focal path belonging to the respective focal position (Abstract).

With respect to claim 3, Tam further discloses the beam includes an extent in the direction of rotation and an extent in the direction of the axis of rotation (Figures 2 and 4).

Tam et al. further teaches arranged centrally in the beam, as based on the extent of the beam in the direction of the axis of rotation, are weighted to a relatively greater extent than the rays arranged close to the edge in the beam, as based on the extent of the beam in the direction of the axis of rotation (Equation 5).

With respect to claim 4, Tam et al. further teaches converting, before filtering, the initial data obtained in fan beam geometry in the form of rays $P(\alpha,\beta, q)$ into parallel data present in parallel beam geometry in the form of rays $P(\theta, \beta, q)$ or $P(\theta, p, q)$, where

α is the focal angle

β is the fan angle

q is the row index of the detector system corresponding to the z coordinate,

$\theta = \alpha + \beta$ is the parallel fan angle,

$p = R_F \sin(\beta)$ is the parallel coordinate corresponding to the distance of the ray from the axis of rotation (system axis), and

R_F is the radius of the focal path (Pages 378- 379, section II. A. Pseudocode description of the four-step algorithm).

With respect to claim 9, Tam further discloses the detector array includes detector elements arranged in the manner of rows (Col. 3, lines 65-67).

Tam et al. further teaches the weighting function represents a function of the row number W(q) (Equation 5).

With respect to claim 13, Tam further discloses the detector elements on the detector array are arranged distributed in rows and lines (Col. 3, lines 65-67).

With respect to claim 14, Tam discloses a CT device (Figure 2) for scanning an object (216) under examination, comprising:

means for scanning (208) the object, including at least one focus from which a beam originates (Figure 2);

a detector array (212) including a plurality of distributed detector elements (Col. 3, lines 65-67), the at least one focus is movable relative to the object on at least one focal path running around the object (Abstract and Figure 2) and the detector array is adapted to supply data representing an attenuation of the rays passing through the object (Col. 4, lines 15-26);

means for filtering the detected data (206);

means for backprojecting the filtered data (206), three-dimensionally (Abstract), to produce at least one slice of a layer of the object having a layer thickness, the slice representing radiation absorption values of voxels belonging to the layer (Col. 4, lines 27-30);

and means for collecting the data (Figure 2).

Tam fails to explicitly disclose during the backprojection, the rays are weighted as a function of corresponding position in the beam; and

Tam et al. teaches the rays are weighted as a function of corresponding position in the beam (Equation 5).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device of Tam to include the weighting of Tam et al., since a person

would have been motivated to make such a modification to improve imaging improving reconstruction speed as is known in the art.

With respect to claim 15, Tam further discloses at least one of the means are at least partly implemented by at least one of programs and program modules (Col. 4, lines 15-26).

With respect to claim 16, Tam further discloses the beam includes an extent in the direction of rotation and an extent in the direction of the axis of rotation (Figures 2 and 4).

Tam et al. further teaches arranged centrally in the beam, as based on the extent of the beam in the direction of the axis of rotation, are weighted to a relatively greater extent than the rays arranged close to the edge in the beam, as based on the extent of the beam in the direction of the axis of rotation (Equation 5).

With respect to claim 19, Tam further discloses the detector elements on the detector array are arranged distributed in the manner of a matrix (Col. 3, lines 65-67).

With respect to claim 21, Tam further discloses an apparatus operable to perform the method (Figure 2).

With respect to claim 22, Tam further discloses the apparatus includes a CT scanner (Figure 2).

With respect to claim 24, Tam further discloses a CT device operable to perform the method (Figure 2).

4. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tam in view of Tam et al. as applied to claim 1 above, and further in view of Proksa (US 2001/0031032 A1).

With respect to claim 12, Tam as modified above suggests the method as recited above.

Tam further discloses the focal path is a spiral path (Figure 2).

Tam fails to explicitly disclose path which is brought about by the focus being moved about the system axis on a circular path and, at the same time, a relative movement between focus and object under examination in the direction of the system axis taking place.

Proksa teaches path which is brought about by the focus being moved about the system axis on a circular path and, at the same time, a relative movement between focus and object under examination in the direction of the system axis taking place (Paragraph 22).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the method as modified above the movement of Proksa, since a person would have been motivated to make such a modification my improving imaging by performing a helical scan in a manner which involves a smooth transition from one radiation source position to the next (Paragraph 13) as taught by Proksa.

5. Claims 20 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tam in view of Tam et al. as applied to claim 1 above, and further in view of Hsieh (6,529,575).

With respect to claim 20, Tam as modified above suggests the method as recited above.

Tam fails to explicitly disclose a computer-readable medium comprising computer executable instructions configured to cause a computer to perform a method.

Hsieh teaches a computer-readable medium comprising computer executable instructions configured to cause a computer to perform a method (Col. 8, line 57 - Col. 9, line 12).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the method of Tam as modified above the computer readable medium of Hsieh, since person would have been motivated to make such a modification to improve imaging by more easily updating existing systems to implement the invention (Col. 8, line 66 - Col. 9, line 1) as taught by Hsieh.

With respect to claim 23, Tam as modified above suggests the method as recited above.

Tam fails to explicitly disclose a computer-readable medium having code portions embodied thereon that, when read by a processor, cause said processor to perform a method.

Hsieh teaches a computer-readable medium having code portions embodied thereon that, when read by a processor, cause said processor to perform a method (Col. 8, line 57 - Col. 9, line 12).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the method of Tam as modified above the computer readable medium of Hsieh, since person would have been motivated to make such a modification to improve imaging by more easily updating existing systems to implement the invention (Col. 8, line 66 - Col. 9,

line 1) as taught by Hsieh.

6. Claims 1-5, 9, 11, 13-15, 18-19, 21-22 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Proksa et al. (US 6,285,733 B1) in view of Grass et al. ("3D Cone-beam CT Reconstruction for Circular Trajectories", 2000, Physics in Medicine and Biology, Volume 45, Pages 329-347).

With respect to claim 1, Proksa et al. discloses a method of creating images in computed tomography (Abstract), comprising:

rotating at least one focus (Figure 1), to scan an object under examination with a beam originating from the at least one focus, relative to the object on at least one focal path running around the object (Figure 1), a detector array including a plurality of distributed detector elements is adapted to detect rays of the beam and is adapted to supply initial data representing an attenuation of the rays passing through the object under examination (Col. 4, lines 12-26 and Figure 1);

filtering the initial data (108);

backprojecting the filtered initial data, three-dimensionally (Col. 2, lines 7-8 and 37-38), to produce at least one slice of a layer of the object having a layer thickness, the slice representing radiation absorption values of voxels belonging to the layer of the object (Col. 2, lines 7-8 and 37-38).

Proksa et al. fails to explicitly disclose during the backprojection, the rays are weighted as a function of corresponding position in the beam.

Grass et al. teaches during the backprojection, the rays are weighted as a function of corresponding position in the beam (Equation 7 and Figure 3).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method of Proksa et al. to include the reconstruction of Grass et al., since person would have been motivated to make such a modification to improve imaging by reducing computational complexity (Pages 333, lines 20-21) and reducing low-intensity drop (Page 338, lines 11-12) as taught by Grass et al.

With respect to claim 2, Grass et al. further teaches the filtering is carried out in the direction of the tangent to the focal path belonging to the respective focal position (Page 333, lines 23-24 and Page 338, lines 34-38).

With respect to claim 3, Proksa et al. further discloses the beam includes an extent in the direction of rotation and an extent in the direction of the axis of rotation (Abstract and Figures 1-5).

Grass et al. further teaches arranged centrally in the beam, as based on the extent of the beam in the direction of the axis of rotation, are weighted to a relatively greater extent than the rays arranged close to the edge in the beam, as based on the extent of the beam in the direction of the axis of rotation (Equation 7 and Figure 3).

With respect to claim 4, Grass et al. further teaches converting, before filtering, the initial data obtained in fan beam geometry in the form of rays $P(\alpha,\beta, q)$ into parallel data present in parallel beam geometry in the form of rays $P(\theta, \beta, q)$ or $P(\theta, p, q)$, where

α is the focal angle

β is the fan angle

q is the row index of the detector system corresponding to the z coordinate,

$\theta = \alpha + \beta$ is the parallel fan angle,

$p = R_F \sin(\beta)$ is the parallel coordinate corresponding to the distance of the ray from the axis of rotation (system axis), and

R_F is the radius of the focal path (Pages 330-334, Section 2. The T-FDK method and Figures 1-3).

With respect to claim 5, Grass et al. further teaches the backprojection of the parallel data is carried out and, in the course of the backprojection for each voxel V(x, y, z), for each $\theta \in [0,\pi]$ for the rays $P(\theta + k\pi, \tilde{\beta}, q)$ and $P(\theta + k\pi, \hat{\beta}, q)$ whose projection along the system axis goes through (x, y), the sum

$$P_{x,y,z}(\theta) = \sum_k \sum_q W \cdot h\left(d_{x,y,z}\left(\theta + k\pi, \begin{Bmatrix} \tilde{\beta} \\ \hat{\beta} \end{Bmatrix}, q\right)\right) \cdot P\left(\theta + k\pi, \begin{Bmatrix} \tilde{\beta} \\ \hat{\beta} \end{Bmatrix}, q\right)$$ is formed, where

x, y, z are the coordinates of the respective voxel V(x, y, z),

k is a whole number corresponding to the number of half revolutions of the focus included in the reconstruction,

$\tilde{p}$ are the parallel coordinates of those rays whose projections along the system axis run through the coordinates (x, y) of the respective voxel V(x, y, z),

$\tilde{\beta}$ are the fan angles of those rays whose projections along the system axis run through the coordinates (x, y) of the respective voxel V(x, y, z),

h is a weighting function determining the layer thickness of the layer of the object under examination represented in the slice produced,

d is a function which is equal to the distance of the respective ray from the corresponding voxel V(x, y) or is dependent on the distance of the respective ray from the corresponding voxel V(x, y), and

W represents a weighting function which weights rays with a large parallel fan angle θ less than rays with a small parallel fan angle θ (Equation 6).

With respect to claim 9, Proksa et al. further discloses the detector elements are arranged distributed in rows and columns on the detector array (Figure 1).

With respect to claim 11, Proksa et al. further discloses the focal path is a circular path (17).

With respect to claim 13, Proksa et al. further discloses the detector elements on the detector array are arranged distributed in rows and lines (Figure 1).

With respect to claim 14, Proksa et al. discloses a CT device (Figure 1) for scanning an object (13) under examination, comprising:

means for scanning the object (1, 2, 5 and 7 and Figure 1), including at least one focus (S) from which a beam (4) originates (Figure 1);

a detector array (16) including a plurality of distributed detector elements (Figure 1), the at least one focus is movable relative to the object on at least one focal path running around the object (Figure 1) and the detector array is adapted to supply data representing an attenuation of the rays passing through the object (Col. 4, lines 12-26 and Figure 1);

means for (10) filtering the detected data (108);

means for (10) backprojecting the filtered data, three-dimensionally (Col. 2, lines 7-8 and 37-38), to produce at least one slice of a layer of the object having a layer thickness, the slice representing radiation absorption values of voxels belonging to the layer (Col. 2, lines 7-8 and 37-38); and

means for collecting the data (Figure 1).

Proksa et al. fails to explicitly disclose during the backprojection, the rays are weighted as a function of corresponding position in the beam.

Grass et al. teaches during the backprojection, the rays are weighted as a function of corresponding position in the beam (Equation 7 and Figure 3).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device of Proksa et al. to include the reconstruction of Grass et al., since person would have been motivated to make such a modification to improve imaging by reducing computational complexity (Pages 333, lines 20-21) and reducing low-intensity drop (Page 338,

lines 11-12) as taught by Grass et al.

With respect to claim 15, Proksa et al. further discloses at least one of the means are at least partly implemented by at least one of programs and program modules (Col. 4, lines 47-56).

With respect to claim 16, Proksa et al. further discloses the beam includes an extent in the direction of rotation and an extent in the direction of the axis of rotation (Abstract and Figures 1-5).

Grass et al. further teaches arranged centrally in the beam, as based on the extent of the beam in the direction of the axis of rotation, are weighted to a relatively greater extent than the rays arranged close to the edge in the beam, as based on the extent of the beam in the direction of the axis of rotation (Equation 7 and Figure 3).

With respect to claim 18, Proksa et al. further discloses the detector array includes detector elements arranged in the manner of rows (Figure 1).

Grass et al. further teaches the weighting function represents a function of the row number W(q) (Page 333, lines 16-31 and Figure 3).

With respect to claim 19, Proksa et al. further discloses the detector elements on the detector array are arranged distributed in the manner of a matrix (Figure 1).

With respect to claim 21, Proksa et al. further discloses an apparatus operable to perform

a method (Figure 1).

With respect to claim 22, Proksa et al. further discloses the apparatus includes a CT scanner (Figure 1).

With respect to claim 24, Proksa et al. further discloses a CT device operable to perform a method (Figure 1).

7. Claims 20 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Proksa et al. in view of Grass et al. as applied to claim 1 above, and further in view of Hsieh.

With respect to claim 20, Proksa et al. as modified above suggests the method as recited above.

Proksa et al. fails to explicitly disclose a computer-readable medium comprising computer executable instructions configured to cause a computer to perform a method.

Hsieh teaches a computer-readable medium comprising computer executable instructions configured to cause a computer to perform a method (Col. 8, line 57 - Col. 9, line 12).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the method of Proksa et al. as modified above the computer readable medium of Hsieh, since person would have been motivated to make such a modification to improve imaging by more easily updating existing systems to implement the invention (Col. 8, line 66 - Col. 9, line 1) as taught by Hsieh.

With respect to claim 23, Proksa et al. as modified above suggests the method as recited above.

Proksa et al. fails to explicitly disclose a computer-readable medium having code portions embodied thereon that, when read by a processor, cause said processor to perform a method.

Hsieh teaches a computer-readable medium having code portions embodied thereon that, when read by a processor, cause said processor to perform a method (Col. 8, line 57 - Col. 9, line 12).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the method of Proksa et al. as modified above the computer readable medium of Hsieh, since person would have been motivated to make such a modification to improve imaging by more easily updating existing systems to implement the invention (Col. 8, line 66 - Col. 9, line 1) as taught by Hsieh.

8. Claims 6-8, 10 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Proksa et al. in view of Grass et al. as applied to claim 1 above, and further in view of Bruder et al. ("Performance of Approximate cone-beam reconstruction in multi-slice computed tomography", 2000, SPIE, Volume 3979, Pages 541-553).

With respect to claim 6, Proksa et al. as modified above suggests the method as recited above.

Proksa et al. fails to disclose during the backprojection of the parallel data, the normalized weights and normalized projections are formed.

Bruder et al. discloses during the backprojection of the parallel data, the normalized weights and normalized projections are formed (Equations 2 and 3).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include in the method of Proksa et al. as modified above the normalizing of Proksa et al., since person would have been motivated to make such a modification to improve imaging by appropriately considering the contribution of each ray of each projection makes to the backprojection (Page 543, lines 29-30) as implied by Bruder et al.

With respect to claim 7, Grass et al. further teaches the weighting function represents a function of the parallel fan angle with $W(\theta + k\pi)$ (Page 333, lines 16-31 and Figure 3).

With respect to claim 8, Grass et al. further teaches the weighting function $W(\theta + k\pi)$ represents a smooth function having the value 1 for centrally arranged rays in the beam, based on the parallel fan angle, and tending to 0 for rays arranged at the edge (Pages 330-334, Section 2. The T-FDK method and Figures 1-3).

With respect to claim 10, Grass et al. further teaches the weighting function W(q) represents a smooth function having the value 1 for rays to at least one centrally located detector row and tending to 0 for rays to detector rows at the edge (Pages 330-334, Section 2. The T-FDK method and Figures 1-3).

With respect to claim 17, Grass et al. further teaches the weighting function represents a function of the parallel fan angle with $W(\theta + k\pi)$ (Pages 330-334, Section 2. The T-FDK method and Figures 1-3).

Double Patenting

9. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

10. Claims 1-2, 4-8, 11-15 and 19 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-6, 11 of U.S. Patent No. 6,839,400 B2. Although the conflicting claims are not identical, they are not patentably distinct from each other because the claims in the patent are narrower and therefore anticipate the claims of the instant application for the reasons that follow below.

With respect to claim 1, U.S. Patent No. 6,839,400 B2 claims a method of creating images in computed tomography, comprising:

rotating at least one focus, to scan an object under examination with a beam originating from the at least one focus, relative to the object on at least one focal path running around the object, wherein a detector array including a plurality of distributed detector elements is adapted to detect rays of the beam and is adapted to supply initial data representing an attenuation of the rays passing through the object under examination;

filtering the initial data;

backprojecting the filtered initial data, three-dimensionally, to produce at least one slice of a layer of the object having a layer thickness, the slice representing radiation absorption values of voxels belonging to the layer of the object, wherein, during the backprojection, the rays are weighted as a function of corresponding position in the beam (Claim 1).

With respect to claim 2, U.S. Patent No. 6,839,400 B2 claims the filtering is carried out in the direction of the tangent to the focal path belonging to the respective focal position (Claims 5 and 11).

With respect to claim 4, U.S. Patent No. 6,839,400 B2 claims converting, before filtering, the initial data obtained in fan beam geometry in the form of rays P(α,β, q) into parallel data present in parallel beam geometry in the form of rays P(θ, β, q) or P(θ, p, q), where

α is the focal angle

β is the fan angle

q is the row index of the detector system corresponding to the z coordinate,

θ = α + β is the parallel fan angle,

p = $R_F$sin (β) is the parallel coordinate corresponding to the distance of the ray from the axis of rotation (system axis), and

R_F is the radius of the focal path (Claim 2).

With respect to claim 5, U.S. Patent No. 6,839,400 B2 claims the backprojection of the parallel data is carried out and, in the course of the backprojection for each voxel V(x, y, z), for each θ.epsilon.[o,π] for the rays P(θ +kπ, $\tilde{\beta}$, q) and P(θ +kπ, $\tilde{p}$, q) whose projection along the system axis goes through (x, y), the sum

$$P_{x,y,z}(\theta) = \sum_k \sum_q W \cdot h\left(d_{x,y,z}\left(\theta + k\pi, \begin{Bmatrix} \tilde{p} \\ \tilde{\beta} \end{Bmatrix}, q\right)\right) \cdot P\left(\theta + k\pi, \begin{Bmatrix} \tilde{p} \\ \tilde{\beta} \end{Bmatrix}, q\right)$$

is formed, where

x, y, z are the coordinates of the respective voxel V(x, y, z),

k is a whole number corresponding to the number of half revolutions of the focus included in the reconstruction,

$\vec{p}$ are the parallel coordinates of those rays whose projections along the system axis run through the coordinates (x, y) of the respective voxel V(x, y, z),

are the fan angles of those rays whose projections along the system axis run through the coordinates (x, y) of the respective voxel V(x, y, z),

h is a weighting function determining the layer thickness of the layer of the object under examination represented in the slice produced,

d is a function which is equal to the distance of the respective ray from the corresponding voxel V(x, y) or is dependent on the distance of the respective ray from the corresponding voxel V(x, y), and

W represents a weighting function which weights rays with a large parallel fan angle θ less than rays with a small parallel fan angle θ (Claim 3).

With respect to claim 6, U.S. Patent No. 6,839,400 B2 claims during the backprojection of the parallel data, the sum

$$H = \sum_{k} \sum_{q} W \cdot h\left(d_{x,y,z}\left(\theta + k\pi, \begin{Bmatrix} \tilde{p} \\ \tilde{\beta} \end{Bmatrix}, q\right)\right)$$

normalized to the sum H of the weights h

$$P_{x,y,z}(\theta) = \frac{1}{H} \sum_{k} \sum_{q} W \cdot h\left(d_{x,y,z}\left(\theta + k\pi, \begin{Bmatrix} \tilde{p} \\ \tilde{\beta} \end{Bmatrix}, q\right)\right) \cdot P\left(\theta + k\pi, \begin{Bmatrix} \tilde{p} \\ \tilde{\beta} \end{Bmatrix}, q\right)$$

is formed (Claim 4).

With respect to claim 11, U.S. Patent No. 6,839,400 B2 claims the focal path is a circular path (Claims 6 and 12-15).

With respect to claim 12, U.S. Patent No. 6,839,400 B2 claims the focal path is a spiral path which is brought about by the focus being moved about the system axis on a circular path and, at the same time, a relative movement between focus and object under examination in the direction of the system axis taking place (Claims 7-8).

With respect to claim 13, U.S. Patent No. 6,839,400 B2 claims the detector elements on the detector array are arranged distributed in rows and lines (Claim 1).

With respect to claim 19, U.S. Patent No. 6,839,400 B2 claims the detector elements on the detector array are arranged distributed in the manner of a matrix (Claim 1).

11. Claims 14, 21-22 and 24 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 1 of U.S. Patent No. 6,839,400 B2 in view of Proksa et al. (US 6,285,733 B1).

With respect to claim 14, U.S. Patent No. 6,839,400 B2 claims CT scanning an object under examination, comprising:

scanning the object, including at least one focus from which a beam originates;

a detector array including a plurality of distributed detector elements, the at least one focus is movable relative to the object on at least one focal path running around the object and wherein the detector array is adapted to supply data representing an attenuation of the rays passing through the object;

filtering the detected data;

backprojecting the filtered data, three-dimensionally, to produce at least one slice of a layer of the object having a layer thickness, the slice representing radiation absorption values of voxels belonging to the layer, during the backprojection, the rays are weighted as a function of corresponding position in the beam; and

collecting the data (Claim 1).

U.S. Patent No. 6,839,400 B2 fails to claim means for scanning, means for filtering, means for backprojecting and means for collecting.

Proksa et al. teaches means for scanning, means for filtering, means for backprojecting and means for collecting (Figure 1).

It would have been obvious to one of ordinary skill in the art at the time the invention was claimed to modify the claims of U.S. Patent No. 6,839,400 B2 to include the device with means of Proksa et al., since a person would have been motivated to make such a modification to improve patient health by utilizing an apparatus in which patient scanning is conducted and on which the reconstruction method was implemented.

With respect to claims 21-22 and 24, U.S. Patent No. 6,839,400 B2 claims the method of claim 1 as recited above.

U.S. Patent No. 6,839,400 B2 fails to claim an apparatus operable to perform the method, where the apparatus includes a CT scanner and the CT device operable to perform the method.

Proksa et al. teaches an apparatus operable to perform the method, where the apparatus includes a CT scanner and the CT device operable to perform the method (Figure 1).

It would have been obvious to one of ordinary skill in the art at the time the invention was claimed to modify the claims of U.S. Patent No. 6,839,400 B2 to include the device of Proksa et al., since a person would have been motivated to make such a modification to improve patient health by utilizing an apparatus in which patient scanning is conducted and on which the reconstruction method was implemented.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOHN M. CORBETT whose telephone number is (571)272-8284. The examiner can normally be reached on M-F 8 AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward J. Glick can be reached on (571) 272-2490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J. M. C./
Examiner, Art Unit 2882

/Edward J Glick/
Supervisory Patent Examiner, Art Unit 2882